

POWER GRID CORPORATION OF INDIA LIMITED

ANNEXURE-IV

**TECHNICAL SPECIFICATION
FOR
VISUAL MONITORING SYSTEM**

Technical Specification of Visual Monitoring System

Power Grid Corporation of India Limited (POWERGRID) intends to install Visual Monitoring System (VMS) for security purposes in Battery Energy Storage Substation (BESS) environment for surveillance of the premises and other POWERGRID locations.

1. Scope

The scope of work of the Bidder shall cover following, but not limited to:

- Design, supply, erect, test and commission the complete system including cameras, Network video recorder system, Storage, mounting arrangement for cameras, cables, LAN Switches, UPS and any other items/accessories required to complete the system.
- Carryout complete application engineering so as to achieve the desired objectives with the stated performance requirement.
- Provide all hardware and latest secured version of software, as necessary, to meet functional requirements of the tender.
- Any hardware, software and firmware required to meet the tender requirements shall be provided by the vendor without any time and cost implication.

System with Color IP based Fixed Cameras for VMS surveillance would be located at various locations as per site condition.

The number of cameras and their locations shall be decided in such a way that it provides detection capability with minimum detection range of 100 meter and minimum IR range of 50 meters in the premises of substation, regional offices, corporate centre, project site, and other locations.

The cameras can be mounted on structures, buildings, wall, or any other suitable mounting arrangement to avoid any blind zone. Typical architecture of VMS system is shown in Figure-1; however, the architecture may be changed as per requirement during detailed engineering and the same to be approved by Engineer-In-Charge.

2. Technical requirements of Visual Monitoring System

- 2.1. The system should facilitate viewing of live and recorded images controlling of all cameras by the authorized users.
- 2.2. The system shall use video signals from color cameras installed at different locations, process them for viewing on workstation/monitors in the specified places as per architecture.
- 2.3. The System shall provide sufficient storage of all the cameras recording for a minimum period of 15 days @ 15 FPS for cameras placed at non-critical locations, & 180 days @ 15 FPS for cameras placed at “Important / sensitive zones” at 4 CIF or better quality using necessary compression techniques for all cameras and the Bidder shall calculate the requirement of storage accordingly. It shall be insured that data once recorded shall not be altered by any means. The recording resolution and frame rate for each camera shall be user programmable.
- 2.4. The Surveillance VMS system shall operate on 230V AC ($\pm 10\%$) power supply (other than Substations) and 220V DC/110V DC ($+10\%/-15\%$) (in case of Substation premises) except NVR, Storage, Client Machine placed in the control room. For VMS

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equipment's placed in the switchyard (in case of Substation premises), the power supply shall be extended from the 220V DC/ 110V DC (+10%/-15%) from nearby BMK/distribution board in the switchyard. Providing necessary MCBs to fetch the supply from BMK is in the scope of contractor.

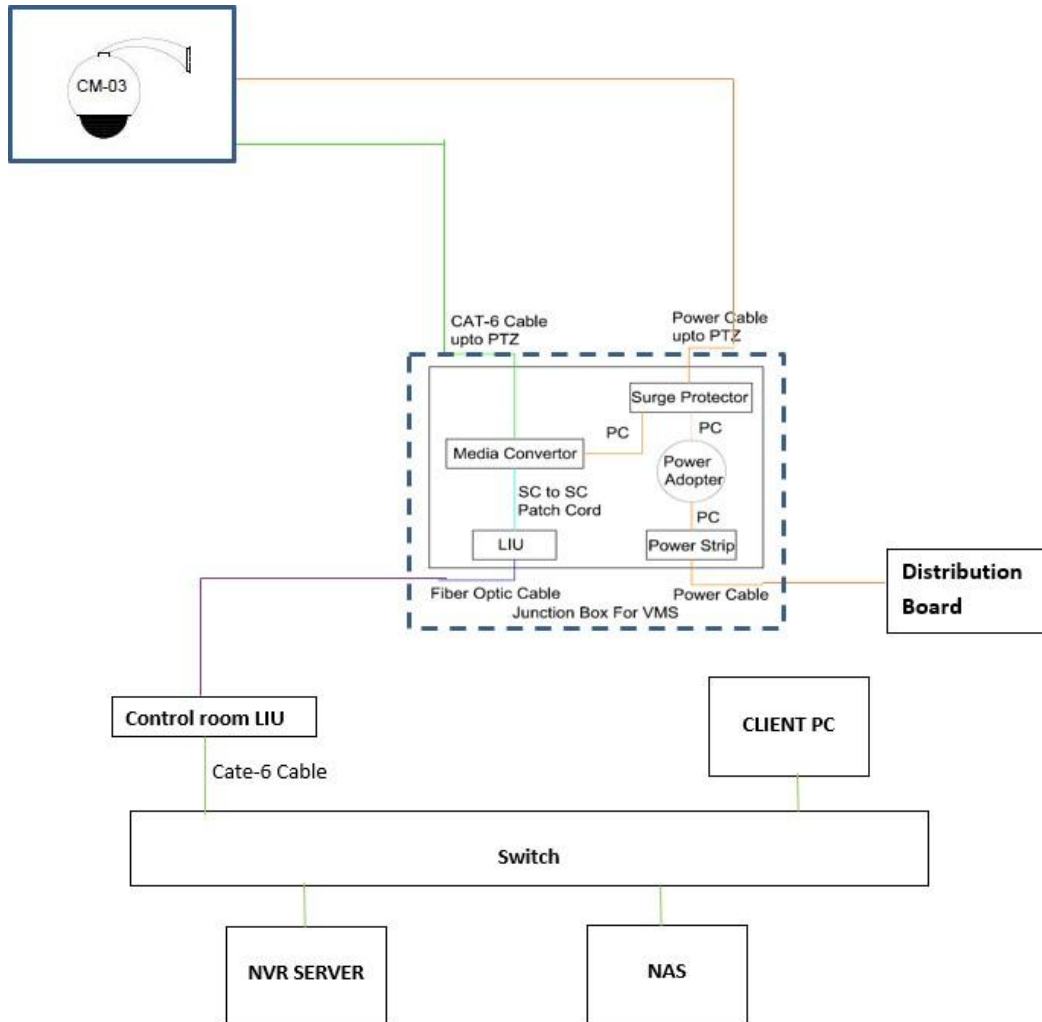


Figure 1: Typical Architecture of VMS System

3. System requirements

- 3.1. System must provide built in facility of watermarking or Digital certificate to ensure tamperproof recording.
- 3.2. All cameras may be connected through an LAN.
- 3.3. All camera recording shall have Camera ID & location/area of recording as well as date/time stamp. Camera ID, location/area of recording & date/time shall be programmable by the system administrator with Password.
- 3.4. Facility of camera recording in real-time mode (25 FPS)/15/12.5/10 or lower FPS as well as in any desired combination should be available in the system.
- 3.5. Facility of camera recording in HD (1280x720p), D1, 4CIF, CIF, VGA, as well as in any combination i.e. any camera can be recorded in any quality.

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- 3.6. In order to optimize the memory, while recording, video shall be compressed using H.265/MPEG-4 or better standard and streamed over the IP network.
- 3.7. System shall be triplex i.e. it should provide facility of simultaneously Viewing, Recording & replay.
- 3.8. The equipment should generally conform to Electromagnetic compatibility requirements.
- 3.9. The system should support time synchronization from GPS/NavIC signal through IRIG-B, RS232/485, SNTP, etc.
- 3.10. The system should also support recording and storage of event logs like user logins, settings changes, remote logins, exporting of recordings, etc.

4. VIDEO SURVEILLANCE APPLICATION SOFTWARE

- 4.1. Video surveillance application software should be capable to display and manage the entire surveillance system.
- 4.2. The software should have inbuilt facility to store configuration of cameras.
- 4.3. The software should support flexible 1/2/4/8/16/32 Windows Split screen display mode and scroll mode on the PC monitor.
- 4.4. The software should be able to control all cameras i.e., Iris control, auto / manual focus, and color balance of camera, Video tour selection etc.
- 4.5. The software should have user access authority configurable on per device or per device group basis. The system shall provide user activity log with user ID, time stamp, action performed, etc.
- 4.6. The user should be on a hierarchical basis as assigned by the administrator.
- 4.7. It should have recording modes viz. continuous, manual, or programmed modes on date, time and camera-wise. All modes should be disabled and enabled using scheduled configuration. It should also be possible to search and replay the recorded images on date, time and camera-wise. It should have the facility for scheduled recording. Different recording speeds (FPS) and resolution for each recording mode for each camera should be possible.
- 4.8. The software for clients should also be working on a browser-based system for remote users.
- 4.9. The software should be capable of integrating ONVIF compliant cameras.
- 4.10. The software should allow retrieval of data instantaneously or any date / time interval chosen through functionality of the application software. In case data is older than 15 days for cameras placed at non-critical locations and 180 days for cameras placed at "important/sensitive" locations and available, even then, the retrieval should be possible. The system should also allow for backup of specific data on any drives like DVD's or any other device in a format which can be replayed through a standard PC based software.
- 4.11. The software should provide the full functionality reporting tool which can provide reports for user login/logoff, camera accessibility report, and server health check reports etc.
- 4.12. The Software should record in auto FIFO (first in and first out) mode and should maintain minimum storage requirements of 15 days for cameras placed at non-critical

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locations and 180 days for cameras placed at "important/sensitive" locations at any given point of time.

5. Network Video Recorder

Function of Network Video Recorder server is to keep the VMS application along with database. The minimum configuration of Network Video Recorder shall be as detailed below:

A. Functional Requirement

1	Recording and Display frame rate	Real-time 15 frames per second per channel, manual select.
2	Recording resolution	(PAL):1280X720,704(H)X576(V)
3	Compression method	H.265/MPEG4 or Better
4	Video Motion Detection Capable	Standard and built-in (selectable in menu)
5	Monitoring options	Split screen 1,2,4,8,16,32 or more cameras
6	Playback options	Search, still image capture
7	Alarm/Event recording capable	To be provided with built-in external alarm input/output ports minimum.
8	Network operation capable	To be provided by using WAN or LAN
9	Viewing Capable from a central system.	Using WAN or LAN router
10	HDD storage consumption	As per calculation based on frame speed, resolution setting, compression (Storage shall be in NAS)
11	Operation	Triplex operation (Simultaneously Viewing, recording and replay)

B. Technical Requirements

Sr. No.	Item NVR server	Minimum Characteristics
1	General features	
a.	Processor and Clock	Processor (Latest Version), 8 cores or better, 3.0 Ghz (min.)
b.	Operating System	Windows 2025 server or Linux Redhat v9.5 or latest tested compatible with VMS application along with licensed Anti-virus. In case, the End of Life/End of Support declared for offered Operating System, the Contractor has to Upgrade to latest version prior to SAT of System.
c.	Cache	16 MB Cache
d.	RAM	32 GB memory
e.	DIMM Slots	4

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f.	Hard Disk	16 TB (minimum) capacity with Raid 5 or latest suitable configuration The NVR storage shall have an additional camera integration capacity of 25%
g.	Storage Drive	DVD +/- RW
h.	Support for both IPv4 and IPv6	Yes (Static IP)
i.	CPU core	8 Core with a GPU card (min 4 GB) or better
j.	Support SNMP v1/v2/v3	Yes
2.	Interface	
a.	I/O ports	1 x serial port, 1 x parallel port
b.	Ethernet ports	Dual 10/100/1000 Ethernet (RJ-45 port)
c.	Expansion Slots	PCIe Slots- 2nos
3.	Power Supply	Redundant (2 Ports) input Supply 230V AC (+/-10%) 50Hz
4.	Environmental aspects	
a.	Relative Humidity	+5% of climatic condition of place
5.	User Interface	
a.	Monitor	TFT 22" High resolution monitor
b.	Keyboard	Yes
c.	Mouse	Yes
d.	Speakers with Audible Alarms	external speakers
6.	Anti-Virus Support	Yes (licensed), which can be patched offline using a central system.

6. Camera Features

- 6.1. The color IP camera shall be IP type.
- 6.2. The camera at the gate shall be used for monitoring entry and exit.
- 6.3. The camera shall be suitable for wall mounting, Ceiling mounting and switchyard structure mounting.
- 6.4. The camera should be able to detect motion in day & night environments having light intensity of 0.5 Lux or better. Camera shall switchover from day to night mode and vice-versa automatically.
- 6.5. All camera recordings shall have camera ID & location/area of recording as well as date/time stamp. Camera ID, location/area of recording date/time shall be programmable by the system administrator.
- 6.6. Facility of camera recording in real-time mode (25 FPS)/15/12.5/10 or lower FPS as well as in any desired combination must be available in the system.
- 6.7. Each camera shall have inbuilt memory feature for back-up configuration/time information when camera is powered off.

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- 6.8. The camera communication port shall be interfaced with media converter (Copper to Fiber) in the junction box. The media converter shall be connected through optical fiber cable to fiber port of LAN switch in control room. The junction box shall be preferred to be mounted on the same/near the structure/wall where camera has been installed.
- 6.9. Power Supply to camera shall be extended from the 230V AC from nearby distribution board in the switchyard/substation. Bidder shall be responsible for providing all installation accessories including industrial grade power converter, surge arrestor for extending supply to camera and its accessories to ensure trouble free operation. The power supply circuits feeding to VMS equipment as mentioned above shall be provided with MCB. Two MCB are to be provided per circuit (Camera) one at source end and one in camera junction box.
- 6.10. The camera should generally conform to Electromagnetic compatibility requirements for outdoor equipment in EHV switchyards.
The equipment should generally conform to Electromagnetic compatibility requirements for outdoor equipment in EHV switchyards. The major EMC required for Cameras and other equipment shall be as under:
- a) Electrical Fast Transient (Level 4) as per IEC 61000-4-4
 - b) Damped Oscillatory (1 MHz and 100 KHz) (level 3) as per IEC 61000-4-18
 - c) Electrostatic Discharge (Level 4) as per IEC 61000-4-2
 - d) Power Frequency Magnetic Field (level 4) as per IEC 61000-4-8
 - e) Ripple on DC Power Supply (level 4) as per IEC 61000-4-17
- Type test reports to establish compliance with the above requirement shall be submitted.
- 6.11. The Cameras shall have inbuilt Video Analytics. The alerts generated from analytics shall be visible in Client application.

IP Fixed Megapixel Camera Specifications

Sr. No.	Parameter	Requirement
1	Image Sensor	2-megapixel Progressive 1/3" or Better CMOS/CCD sensor, Minimum Illumination 0.5 LUX
2	Camera Enclosure Type	IP66 Grade
3	Iris/Focus	Auto/Manual
4	IR capability	50 meters with automatic switching from Daylight to IR mode.
5	Video Compression	User selectable Dual Stream H.265 and MPEG4
6	Video Definition	Primary stream: 1600x1200, 1280x960, 1280x720 or better. Secondary Stream: 800x600, 400x288, 192x144 or better
7	Video Parameters	Brightness, Hue, contrast, saturation and image quality.

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8	Video Frame Rate	PAL: 1-25 Frames/second or better
9	Video Output	One channel composite stream.
10	Supported protocols	TCP-IP, UDP, HTTP, FTP, SMTP, DHCP, DNS, ARP, ICMP, POP3, NTP, UpnP, RTP, RTCP
11	Operating Humidity	+5% of climatic condition of place
12	ONVIF	The camera should be ONVIF (Profile S, T, G & M) compliant
13	Analytics	The Cameras shall have inbuilt Video Analytics. The alerts generated from analytics shall be visible in Client application.

Outdoor Integrated IP PTZ Colour Camera Specifications

Sl. No.	Description	Minimum Specifications
1	Salient features	<p>a) The cameras shall be IP and the Camera shall be compliant to ONVIF standards. ONVIF Profile (S, T, G & M)</p> <p>b) The cameras shall have PAN, TILT and ZOOM facilities.</p> <p>c) The cameras must be of Day and Night type.</p> <p>d) The cameras must be operative in automatic mode for switching from day mode to night mode depending on the ambient natural light intensity without having to manually operate.</p> <p>e) The Cameras shall be provided with built-in or external alarm input/ output ports minimum (1 in, 1 out)</p> <p>f) The VMS camera shall be suitable for wall mounting, ceiling mounting, pole mounting and switchyard structure mounting. All accessories required for the mounting shall be provided.</p> <p>g) It shall be possible to define at least 64 selectable preset locations so that the camera gets automatically focused on selection of the location for viewing a predefined location. It should be possible to name each of the preset position using at least 16 alphanumeric characters.</p> <p>h) Each Camera shall have an inbuilt memory for back-up configuration/ time information when camera is powered off.</p> <p>i) The cameras features must be quickly and easily accessible by provision of on-screen displays.</p> <p>j) The VMS camera shall have tamper proof feature i.e. it shall inform the Operator of any change in its placement, blocking of the view etc.</p>

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		<p>k) The VMS camera shall store 'Tour' feature, i.e. perform a preconfigured PTZ movement and record the video during this movement. When the operator takes control of the camera, the camera shall move as per the operator's direction and return to the 'Tour' after a preconfigured amount of time. Minimum 2 tours or better per camera.</p> <p>l) The camera shall have Motion Detection feature.</p>
2	Other features	<ul style="list-style-type: none"> • Remote firmware updates • Secure backup of all camera settings • Password protection prevents unauthorized users from altering system settings • Built-in /external surge protection
3	Housing Enclosure	The cameras shall have IP—66 Protection Class enclosures. Enclosure shall have provision (heater, blower, etc.) to avoid fogging during high humidity condition & Camera shall be able to perform satisfactorily.
4	Camera Interface	The camera communication port shall be interfaced with a Media Converter (Copper to Fiber)/ Ethernet switch to be provided in a junction box. This Media Converter/ Ethernet switch shall be connected to fiber port of a network communication switch to be provided in control room through optical fiber cable. The junction box shall be mounted on the same/near the structure where camera has been installed.
5	Camera Mounting	Camera mounting/clamp size shall be robust enough to ensure no vibration which can affect the quality of video particularly at highest zoom level.

SPECIFICATIONS & FEATURES

Camera/Optics:

1.	Image sensor	1/2.8" Progressive scan CMOS
2.	Effective Pixel	(PAL): 1920 X 1080
3.	Lens	f (Focal length) = 4.3mm 129 mm or better, F Number range between F1 .6 -4.7, Horizontal Angle of View: 63 degree-2.3 degree or better
4.	Zoom	30x Optical zoom or better and 12 x digital zoom or better
5.	Electronic Shutter	1 ~ 1/10,000 sec. or better
6.	Iris Control	Automatic with manual override

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7.	SIN (signal to noise Ratio)	≥ 50 dB
8.	Light Sensitivity lux	Color: 0.2 Lux at 30 IRE or better B&W: 0.01 Lux at 30 IRE or better
9.	Wide Dynamic Range	120 dB or better
10.	Scanning System	Progressive
11.	Electronic Image Stabilization	Integrated
12.	Image Enhancement	Integrated
Camera\Video:		
13.	Video Streams	Dual Stream: Primary stream: H.265 Secondary stream: H.265
14.	Available Resolution	Mainstream: 1920x1080/0.3-0.4MPx Sub Stream: 0.1-0.2MPx
15.	Frame rate	FPS should be selectable three setting between 1 -10 FPS and at least two setting between 10-25FPS, so that we can be able to do local recording in NVR with 0.3-0.4MPx resolution with abovementioned selectable FPS for primary stream. For Viewing if primary stream is not available then secondary stream at 1 FPS or better with 0.1-0.2MPx resolution is to be available.
16.	Supported Protocols:	TCP, IP (IPv4 / IPv6 compliant), NTP, UDP, Multicast (IGMP)
17.	Security	Multiple user access with password protection
18.	Panning Range	Complete 360 degrees endless
19.	Pan Speed	Variable 0.1° /sec ~ 120° /sec
20.	Tilting Range	Minimum 180° Tilt Rotation (+/- 90°)
21.	Preset Accuracy	+/- 0.1° or better
22.	PTZ Tracking	The camera should automatically pan, tilt & zoom to follow the moving object until the object stops or disappears from the monitored area
Camera\Dome drive features:		
23.	Video Motion Detection	To detect occurrence of motion in FOV of camera

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General		
24.	Working temperature	-5 ⁰ C to 50 ⁰ C (Test Certificate)
25.	Working Humidity	10 to 90 % (Test Certificate)
26.	Mounting	Camera shall be mounting/clamp size shall be robust enough to ensure no vibration which can affect the quality of video particularly at highest zoom level.
27	Analytics	The Cameras shall have inbuilt Video Analytics. The alerts generated from analytics shall be visible in Client application.

2. Client Machine

Client Machine shall be installed in the Control Room, Substation-in-charge as well as in the security In-charge room. User Interface for VMS software shall be provided on client machines and shall have all the features as per authority assigned by the administrator. The minimum specification for the client machine is as follows: -

Sr. No.	Item	Minimum Characteristics
1	General Features	
a	Processor	1x8 core, 3.2GHz
b	Operating System	Windows 11 Pro or latest compatible with VMS application
c	CPU/Clock Speed	3.2GHz or better
d	RAM	32GB-DDR4 or better (expandable up to 64GB)
e	DIMM Slots	2
f	Hard Disk	Min. 512GB SSD (expandable up to 1TB) and 1TB SATA HDD
g	Storage Drive	DVD +/- RW
h	Support for both IPv4 and	Yes (Static IP)
2	Interface	
a	I/O ports	1 x serial port, 1 x parallel port
b	USB ports	USB2.0/USB3.0 supported (Total 4 ports)
C	Ethernet Ports	2 x 10/100/1000 Mbps Ethernet ports
3	Graphics Card Support	4GB or better
4	User Interface	
a	Monitor	32" IPS widescreen LCD antiglare with WLED backlit colour monitor, resolution of 3840x2160 pixel

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Sr. No.	Item	Minimum Characteristics
b	Keyboard	Yes
c	Mouse	Yes
d	Speakers with Audible Alarms	USB powered external speakers
5	Power Supply	
a	Input	230 V (+/-10%) AC, 50 Hz
6	Anti-Virus Support	Yes (licensed), which can be patched offline

8. Power Supply (UPS) for NVR , Storage and Client Machines

UPS having minimum specification as detailed below shall be provided for NVR server, Storage and Client Machines located at the central location of Security VMS system.

Sr. No.	Parameter	Requirement
1	Rating	5KVA
2	Type	Online Microprocessor controlled IGBT based High Frequency.
3	Input	230V AC +/-10%
4	Output	230V AC +/-1%
5	Frequency	50Hz +/- 0.3%
6	Battery	Maintenance Free for 30 Min Backup.
7	Total Harmonic Dist.	Less than 2.5% for linear load.
8	Display metering	Input AC Voltage, UPS output voltage, UPS output current, UPS output frequency.
9	Display Indication	AC Mains “ON”, UPS “ON”, Overloaded.
10	Alarms (Visual and potential free contact)	DC Under Voltage (Low Battery), UPS overload/Common trouble alarm.

9. Storage

Storage having minimum specification as below shall be provided for archiving of 180 days data for “Important/Sensitive” location cameras and 15 days data from balance cameras (at 4CIF resolution @15FPS)

Sr. No	Item: NAS (Network Attached Storage)	Characteristics
1	Features	
a	User Interface	Status and activity provided via management interface. Status Indicators on front of Controller
b	RAID Level	RAID 6 or better
c	Cache Memory	1GB Read/Write or more
d	Upgradable firmware	Yes

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Sr. No	Item: NAS (Network Attached Storage)	Characteristics
e	Network Connectivity and Protocol Support	Ethernet Support or 2Gbps or better SAS support
f	Processor Speed	1.4 GHz or better
g	Operating System	Windows server 2025 or Redhat Linux 9.5 or better or latest tested version. In case, the End of Life/End of Support declared for offered Operating System, the Contractor has to Upgrade to latest version prior to SAT of System.
2	Interface	2 x 10/100/1000 Mbps Ethernet ports
a	Host port	2Gbps or better SAS ports per controller
b	Management Ethernet Port	Yes
3	No. of Controllers	2
4	Networking	
a	Support for	IP, DHCP and Static IP, Dynamic DNS, Jumbo Frames
b	External Ports:	Minimum 2 Ethernet ports of 10/100/1000 Mbps Base- TX
5	HDD	Hot pluggable HDD trays
a	Support for Storage	Minimum 4TB per bay
b	Minimum Drive Bays	4 Nos
6	Power Supply	
a	Input Requirements	230V (+/-10%) AC
7	Operating Temperature	+5°C of Maximum & -5°C of Minimum of climatic condition of place
8	Backup Capability	Support for full backup of storage with third party tools

10. Substation Ethernet Switches:

10.1. Ethernet Switches:

The Ethernet switch shall be required for networking of NVR server and cameras as per conceptual communication architecture suitable for operational requirements in substation environment. The ethernet switch should be a manageable switch. It shall operate with rated 230V AC ($\pm 10\%$) power supply (other than Substations) and 220V DC/110V DC ($+10\%/-15\%$) (in case of Substation premises). The switches shall be rack mountable in the panel with 19" rack size.. The Ethernet switches shall be compliant to IEC 61850-3.

10.2. Number of ports:

Each switch shall be provided with minimum three types of ports as below:

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- A. Giga Byte (Gig) copper Ethernet port: For connecting storage NVR server & client in redundant mode on different switches.
- B. Fast Ethernet (FE) copper port: For connecting NVR server & client in redundant mode on different switches.
- C. Optical Port (FO): For connecting camera and shall be compatible with communication with media converter installed in Camera JB.

Each switch shall have sufficient number of Gig port, FE port and FO ports. Switches shall be supplied to accommodate all cameras. Cameras are desired to be divided equally among switches to extent possible. The architecture shall be got approved by Engineer-In-charge during detailed engineering.

10.3. Functional Requirements & Features:

- (a) LED indication for port status. supply etc.
- (b) Support single mode fiber with 1310 nm wavelength

11. Fiber Optic Cable

The Bidder shall supply & install the optical fiber approach cable as required based on detailed site survey to be carried out by the Bidder during the project execution and the indicative architecture attached. Fiber Optic Cable shall consist of G.652D DWDM Fibers suitable for direct burial, laying in trenches & PVC/Hume ducts, laying under false flooring and on indoor or outdoor cable raceways.

11.1. Optical Electrical and Mechanical Requirements: The cable core shall comprise of tensile strength member(s), fiber support/bedding structure, core wrap/bedding, and an overall impervious jacket. The Fiber Optic cable is of Single Mode communicating at 1310nm. Fiber Cables shall have minimum 4Core as indicated in the Architecture.

11.2. Installation of Fiber Cable: The existing cable trenches/ cable raceways proposed to be used shall be identified in the survey report. The Bidder shall make its best effort to route the cable through the existing available cable trenches. Where suitable existing cable trenches are not available, same shall be laid buried at a depth of 300 mm in HDPE pipes. All required fittings, supports, accessories, ducts, inner ducts, conduits, risers and any item not specially mentioned but required for laying and installation of Fiber Optic cables shall be supplied and installed by the Bidder.

11.3. Optical Fiber Termination and Splicing: Optical fiber terminations be done in LIUs/ as indicated in the Architecture. FODP/LIU shall be designed to provide protection for fiber splicing of pre-connectorized pigtailed and to accommodate connector termination and coupling of the fiber cables. All the cores of Fiber cable are to be terminated in the LIU at switchyard end.

12. Power Cable

The power cable shall be 3C x 2.5 sq.mm size with stranded copper conductor. The power cable laid in the outdoor switchyard area shall be PVC insulated 1100V grade, armoured, FR type, C1 category conforming to IS:1554 (Part-I) and its amendments.

13. Media converter

Media converter (dual Port) shall be installed preferably in camera JB with suitable mounting arrangement; it will provide interface between camera's Ethernet cables in camera JB to switch installed in control room connected through OFC. It shall have LED indicators showing healthiness of link, power status, etc. It must have suitable Ethernet interface 10/100 Mbps, support IEEE 802.3 10Base-T, 802.3u 100Base-TX and 100Base-FX standards, IEEE 802.3x Flow Control & Back Pressure. The media converter shall have dual port for ring formation, if required, which shall be finalized during detail engineering.

Media converter shall be communicating with substation switch through single mode optical fiber cable on 1310nm wavelength.

It should be of industrial grade type with operating temperature range +5⁰ C of Maximum & -5⁰ C of Minimum of climatic condition of place and humidity +5% of climatic condition of place.

13.1. Cat6 STP cable

Suitable Cat6 STP communication cable for connecting camera with converter installed in camera junction Box.

13.2. Ethernet LAN cable

Suitable cat6 Ethernet LAN cable for connecting NVR server, Storage and Client machine with LAN switch

14. HDPE pipe

It shall be used for laying power cable, optical fiber cable in buried portion at the depth of 300 mm. It shall also be used for laying Ethernet and power cable from Camera JB to Camera on pole/tower. HDPE pipe installed on pole and tower shall be properly clamped. The HDPE pipe shall have minimum "Mean Outside Diameter of 25.00mm or higher". The PE grade of HDPE pipe shall be "PE-80 or higher".

15. Junction Box (JB)

The junction box shall accommodate all the necessary equipments except the camera required at the camera end and shall be mounted on/near the same lattice structure / poles as the camera. All the installation accessories like power converter / LIU / Media converter / Fiber patch cords etc shall be mounted inside the junction box and shall be of industrial grade type suitable for permanent outdoor use in Extra high voltage substation environment upto 765kV for ambient temperature of 0 deg C to +55 deg C and humidity of 10% to 90%. The junction box shall have the following features:

- It should have enough space to accommodate all the equipment.
- It shall have provision for mounting on the lattice structure or supplied pole.
- It shall be made of aluminium of thickness 3mm and shall be weather proof meeting IP 66 rating.

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- It should have suitable terminating blocks/ connections for terminating all types of cables utilized viz. power, Ethernet, fiber etc.
- Size of Junction box 545x545x250 mm minimum.

The Power converter for providing supply to Camera and the media converter shall be 230V AC ($\pm 10\%$) power supply (other than Substations) and 220V DC/110V DC ($+10\%/-15\%$) (in case of Substation premises) as per manufacturer's recommendation. Adequate backup power must be ensured for the cameras in the event of an AC power supply failure, to prevent any disruption to the camera feed.

The junction box shall be earthed to nearest earthing point through 25 X 6 mm GI flat/Braided strips.

16. FODP

FODP (Fiber optic distribution panel) shall be supplied and installed at locations to connect multiple optical fiber cable.

17. Power converter

Suitable industrial grade power converter shall be supplied for converting 230V AC ($\pm 10\%$) power supply (other than Substations) and 220V DC/110V DC ($+10\%/-15\%$) (in case of Substation premises) to rated power supply for camera. Power converter shall be in Junction box. The Contractor shall provide 2 Nos MCB with suitable rating shall be used for each camera. One shall be installed inside Camera JB and other at Source end.

18. MCB

02 Nos MCB with suitable rating shall be used for each camera. One shall be installed inside Camera JB and other at Source end.

19. LIU

LIU shall be supplied with accessories (Suitable Connectors, pig tail, patch cord, etc). LIU shall be used in camera JB and control room. LIU shall be suitable for installation in camera JB and rack at control room. LIU in control room shall have provision to accommodate multiple FO cables.

20. Pole

Bidder shall explore the possibility of installing camera on existing structure (Lighting pole, building structure, etc.), however if suitable structure is not available then pole of suitable height 6m/9m/12m may be chosen depending upon the location. Number of pole requirement shall be earmarked in survey report. Three types of typical pole drawing (6M/9M/12M) attached as reference.

Bidder shall finalize the poles depending upon the location (Along boundary wall, main gate, store, etc.) of cameras with necessary modification (if any) for installation of camera and Junction box during engineering stage. Approval of modified drawing may be taken by concerned department.

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Earthing of the poles should be connected to the switchyard main earth mat wherever it is available, else, the same should be earthed through 3mtr long, 20 mm dia, earth electrode.

21. HDPE Pipe

Suitable HDPE pipe shall be used for laying power cable, OFC cable at road crossing, culvert and in buried portions.

22. Networking Rack

Bidder in coordination with site personnel shall explore the possibility of installing Ethernet LAN switches and LIUs of control room in existing Rack/Panel available at substation. In case of non-availability of space in existing rack/panel, a networking rack shall be provided on approval of site in-charge of POWERGRID to accommodate Ethernet switches and LIUs as per BOQ and specification enclosed. Also place for installation of networking rack shall be earmarked in survey report.

23. Spares

One sets of supplied cameras along with accessories at each substation, detail BOQ of spare is attached.

Availability of Spares

The Bidder shall ensure the availability of spare parts and service support for all items supplied by the Bidder for a period of 07 years from the issuance of TOC (Taking over certificate).

24. Maintenance of System: The VMS system consisting of all the hardware and software to be supplied and commissioned under this package shall be one year warranty i.e. Defect Liability Period (DLP) commencing from the issuance of TOC and six year maintenance period thereafter. The maintenance of the system is to be carried out as per scope of maintenance (AMC).

SCOPE OF MAINTENANCE (AMC):

Introduction:

A comprehensive on-site maintenance shall be offered by the Bidder. The scope shall include all the software and hardware including cameras & accessories supplied by the Bidder for the VMS systems under this project. It shall include repair and replacement of supplied hardware and software to make system operational as per specification.

The essence of the maintenance services is to provide maintenance support for the supplied software and hardware including cameras & accessories, with the goal of meeting the availability as set forth herein.

The period of AMC is six years which commence after Defect Liability Period (DLP).

Comprehensive maintenance shall have two parts, viz:

- I. Preventive Maintenance of VMS
- II. Breakdown Maintenance of VMS

Scope of Bidder:

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- a) On receipt of complaint from the POWERGRID, Corrective / breakdown maintenance shall be attended immediately by the Bidder as per Response Time & Up-Time specified below.
- b) Bidder should maintain sufficient spares without any financial implication to POWERGRID for immediate restoration of the system under breakdown.
- c) A service report has to be submitted by the Bidder to POWERGRID after rectifying the fault. A record will be maintained of all such breakdowns attended by the Bidder.
- d) The faulty device/part shall be issued to Contactor by POWERGRID for further repair and return to POWERGRID site.
- e) The equipment being taken to the Service Centre for repair and its transportation would be at risk and cost of Bidder. Any damage or loss caused to the equipment shall be in the scope of Bidder.
- f) All consumable, spare required for complete AMC work including tools and testing instruments shall be arranged by the Bidder.
- g) Bidder will take all due necessary safety precautions for proper safety of man & machine while carrying out the work at site. Bidder will also be required to take necessary employee (workmen) compensation insurance cover for the personnel deputed for the work covered under this contract. POWERGRID shall have no responsibility whatsoever for claims arising out of accident or any other reason for the personnel deployed by the Bidder.
- h) After completion of the rectification, the Bidder shall submit the root cause of defect and corrective actions done to the Engineer-in-Charge.

Scope of POWERGRID

- a) POWERGRID shall nominate sole coordinator and act as interface between POWERGRID and the Bidder.
- b) POWERGRID shall arrange entry passes/ PTW/Gate pass etc. required for maintenance work entry and exit records at site.
- c) Outage of system due to fiber/power cable cut during bay extension, excavation work etc.; carried out by POWERGRID shall not be considered for penalty

24.1. Preventive Maintenance of VMS:

The Bidder shall carry out the preventive maintenance of the VMS system at site to keep the system running at its optimum level by checking its performance through diagnosis and doing necessary tuning / adjustment including rectification of all software and hardware including cameras & accessories failures and any abnormality observed. The bidder shall carryout quarterly preventive maintenance visits. Purpose of visit is to check proper working of system. Bidder to follow preventive maintenance schedule as per OEM's recommendations.

24.1.1. Following activities shall be carried out during the site visit, but not limited to:

- Check the camera, monitor, server & operator station functioning and overall healthiness of the system
- Cleaning of the camera internals, housing glass

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- Checking of lens operation,
- Checking of components of all CCTV equipment such as enclosure, JB's, Convertors etc
- Check the signal level for clear image quality.
- Servicing and greasing of the camera moving parts, if any.
- Check recording and playback functions.
- Report and attend any problem if found during the checking of the system.
- Prepare and submit the service report in tabular format for each & every component in the CCTV system after every visit to the Engineer-in-charge. In case of any breakdown of Camera or any other equipment, vendor to carry out root-cause analysis & proper precautions to be taken to avoid it happening again.
- Service record sheets, schedule & check list are to be maintained. It is to be signed by vendor's service engineer & POWERGRID site engineer after every service/check.

24.2. Breakdown Maintenance of VMS:

Fault Reporting:

Immediately on noticing the fault, the fault Will be reported by POWERGRID on phone/e-mail to the Bidder and the details will be informed as per enclosed format. The fault reporting time through email shall be taken as reference time for the purpose of calculation of Response time (RT) and up time (UT). The response time and uptime are defined below:

Response Time (RT) – The time taken by the Bidder to reach the site. It will be maximum 48 Hrs excluding Sundays and National Holidays.

Uptime (UT) -The time taken for resolution of the fault. It shall be maximum 48 hours after access to the site.

24.3. Terms of Payment During AMC:

24.3.1. Annual Maintenance (AMC) Charges:

AMC charges shall be paid as per provision in bidding document on submission of invoice by Bidder and on certification by the Employer in line with provision of technical specifications.

24.3.2. Deduction during AMC:

Bidder shall maintain the VMS system as per above defined RT and UT. However, if the RT+UT is greater than 96 Hrs, then (₹...../- to be entered by region/site) per fault/event shall be deducted from the running bill of AMC.

24.4. Taking Over Certificate: Taking over certificate (TOC) shall be issued by Engineer-in-charge after successful commissioning.

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The successful commissioning procedure shall be submitted by Bidder for approval from POWERGRID within 60 days of award of contract.

Anything not mentioned above or in BOQ but required to complete the Job and to make the system functional shall be arranged and supplied by the Bidder adhering to the quality norms as per Technical specification.

The Bidder shall submit a site survey report along with detailed execution plan and layout drawing to Engineer In-charge for approval.

The work shall be executed as per approved site execution plan and layout/Drawing.

25. Cyber Security Requirements

The bidder has to adhere the guidelines/recommendations related to CCTV system issued by various statutory authorities like CEA, Cert-In, NCIIPC, MeitY, etc. The bidder must comply the “**Advisory on the Threat of Information Leakage through CCTV/ Video Surveillance system (VSS)/ Digital Video Recorders /Network Video Recorders**” and its amendments issued by MeitY from time to time. The contractor shall submit the declaration for the compliance of above circular during the detailed engineering stage. The employer shall verify the features during SAT stage. The minimum requirements are summarized as follows:

- a. **CCTV Device testing and certification:** The contractor shall ensure compliance of CCTV Cameras (Analog/ IP/ Analog Speed Dome/ IP Speed Dome) with the Essential Requirements (ERs) notified as part of the PPO for CCTV in Gazette of India (EXTRAORDINARY, PART II—Section 3—Sub-section (ii) dated 7th March, 2024, at Sr. No. No. 1062) to ensure the security of the VSS / CCTV systems, as amended from time to time. The security testing certificate for CCTV/VSS to be issued by Standardisation Testing and Quality Certification (STQC) Laboratory or any other agency notified by MeitY from time to time. The validity of the test report issued by STQC Lab will be three years from the date of issue of the report.

The contractor shall submit the self-signed declaration in case of non-availability of testing facility. The contractor shall carry out required testing for the offered equipment as and when testing facilities are available during entire period of contract.

- b. **Strong Passwords, disable unused features:**

Following to be ensured by the contractor at the time commissioning of CCTV system:

- All default passwords for accessing CCTV and associated equipment such as NVR, client machine, etc. to be changed and updated with strong and unique passwords.
- Unnecessary features which are not required for proper functioning of the CCTV system to be turned off or disabled.
- Unused user accounts (e.g., Guest User), management/media ports, services/daemons on the device to be disabled.
- Change or disable settings that are insecure by default (e.g., default password, SNMP “public” community string).

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- c. **Regular Firmware Updates:** It shall be the responsibility of the contractor to regularly check for updates including security updates provided by OEM for the supplied CCTV cameras and associated equipment and apply them promptly in offline manner.

26. Support during Vulnerability Assessment and Penetration Testing

POWERGRID conducts VA/PT of CCTV system through third party auditor on regular basis. The vendor shall provide support for mitigation of identified security loopholes during the VA/PT.

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Indicative BOQ of VMS system			
Sr. No	Item Description	Unit	Qty.
Supply and Installation as per Technical Specification			
1	Fixed Camera	Set	Shall be finalized during detailed engineering.
2	Outdoor Integrated IP PTZ Color Camera	Set	
3	Junction box	Nos.	
4	Power converter	Nos.	
5	MCB	Nos.	
6	Media converter	Nos.	
7	Light interfacing unit at Camera end	Nos.	
8	Light interfacing unit at control room end	Nos.	
9	Network video recorder with TFT 22" High resolution monitor and NVR application software	set	
10	Ethernet LAN Switch	Nos.	
11	19-inch Networking Rack	Nos.	
12	Optical fiber Cable	meter	
13	Power cable	meter	
14	Cat6 STP cable	meter	
15	Ethernet LAN cable	meter	
16	HDPE Pipe	meter	
17	FODP	Nos.	
18	NAS	set	
19	Pole	Nos.	
20	Client Machine	set	
21	UPS (as per technical specification)	set	

Technical Specification of Visual Monitoring System